Printed Page:-4 **Subject Code:- CBCA0103**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
BCA
SEM: I - THEORY EXAMINATION (2025 - 2026)
Subject: Introduction to Matrices and Calculus

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

1-a. Transpose of a rectangular matrix is a (CO1, K2) 1

(a) diagonal matrix
(b) square matrix
(c) scaler matrix
(d) rectangular matrix

1-b. The cofactor of first element of the matrix $A = \begin{bmatrix} 5 & 7 \\ 3 & -1 \end{bmatrix}$ is (CO1, K3) 1

(a) $a_{11} = -1$
(b) $a_{11} = -3$
(c) $a_{11} = 5$
(d) $a_{11} = -7$

1-c. The domain of the function f(x) = sin x – cos x is (CO2, K2) 1

(a) R-{1}
(b) R
(c) R-{-1,1}
(d) R-{-1}

1-d. If A = {x:x∈*N* , x is factor of 6} and B={x:x∈*N* , x is factor of 8} then find A∩B (CO2, K3) 1

(a) {1,2,4}
(b) {1,2}
(c) {3,6}
(d) {1,2,3,6}

.

1-e. The value of $\lim_{x \to 0} \left(\frac{\sin(3x)}{x}\right)^3$ is (CO3, K3) 1

(a) 0
(b) 3
(c) 9
(d) 27

1-f. The derivative of the function $f(x) = \tan^{-1}(x)$ is (CO3, K1) 1

(a) $1/(x^3+1)$
(b) $1/(x^4+1)$
(c) $1/(x^2+1)$
(d) None of these

1-g. The value of $\int e^{3x}\, dx$ is (CO4, K3) 1

(a) $3e^{3x} + c$
(b) $e^{3x} + c$
(c) $\frac{e^{3x}}{3} + c$
(d) e^x

1-h. The value of $\int \tan x \cot x \, dx$ is (CO4, K3) 1

(a) $x + c$
(b) tan x
(c) $-\tan^2 x \cot^2 x + c$
(d) sinx cosx

1-i. If FISH is written as EHRG in a certain code, then code for JUNGLE be (CO5, K2) 1

(a) ITMFKD
(b) ITNFKD
(c) KVOHMF
(d) TSMFKD

1-j. The average of 10 numbers is 23. If each number is increased by 4, then the new average be (CO5, K3) 1

(a) 23
(b) 29
(c) 25
(d) 27

2. Attempt all parts:-

2.a. If $A = \begin{bmatrix} 1 & 8 \\ 4 & 21 \end{bmatrix}$ find the determinant of the matrix. (CO1, K3) 2

2.b. Define one-one function with example. (CO2, K1) 2

2.c. Define limit of a function. (CO3, K1) 2

2.d. Evaluate $\int_{-\pi}^{\pi} \text{Sinx}\, dx$. (CO4, K3) 2

2.e. If $a-b=3$ and $a^2+b^2=29$, find the value of ab. (CO5, K3) 2

SECTION-B 30

3. Attempt all parts:-

3.a. Answer any one of the following:-

3.a.(i) Solve the equation $\begin{vmatrix} 3x-8 & 3 & 3 \\ 3 & 3x-8 & 3 \\ 3 & 3 & 3x-8 \end{vmatrix}=0$. (CO1, K3) 6

3.a.(ii) Given $3\begin{bmatrix} x & y \\ w & z \end{bmatrix}=\begin{bmatrix} x & 6 \\ -1 & 2w \end{bmatrix}+\begin{bmatrix} 4 & x+y \\ z+w & 3 \end{bmatrix}$. Find x, y and z. (CO1, K3) 6

3.b. Answer any one of the following:-

3.b.(i) Define inverse function. If $x,y \in R$, then find f^{-1} the inverse mapping of $f=\{(x,y): y=3x-2\}$. (CO2, K3) 6

3.b.(ii) If A={1,2,3}, B={2,3,4}, C={1,3,4} and D={2,4,5} then verify that $(A\times B)\cap(C\times D)=(A\cap C)\times(B\cap D)$. (CO2, K3) 6

3.c. Answer any one of the following:-

3.c.(i) Find the $\lim_{x\to -1/2} \frac{8x^3+1}{2x+1}$. (CO3, K3) 6

3.c.(ii) Find the derivative of $y=(5-x^4)^{10}$. (CO3, K3) 6

3.d. Answer any one of the following:-

3.d.(i) Find the value of $\int 3x e^{x^2} dx$. (CO4, K3) 6

3.d.(ii) Evaluate $\int \frac{\sin^{-1}x}{\sqrt{1-x^2}} dx$. (CO4, K3) 6

3.e. Answer any one of the following:-

3.e.(i) A fruit seller had some apples. He sells 40% apples and still has 420 apples. Find the number of apples he had. (CO5, K3) 6

3.e.(ii) There are two examinations rooms A and B. If 10 students are sent from A to B, then the number of students in each room is the same. If 20 candidates are sent from B to A, then the number of students in A is double the number of students in B. Then find the number of students in room. (CO5, K3) 6

SECTION-C 50

4. Answer any one of the following:-

4-a. Using Cramer's rule solve the following system of equations: (CO1, K3) 10

$2x - 3y + z = 7$
$2x + y - z = 1$
$4y + 3z = -11$

4-b. Find the inverse of the matrix $A=\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$. (CO1, K3) 10

5. Answer any one of the following:-

5-a. If f: R → R where $f(x)=x^2+2$ and g: R → R where $g(x)=\frac{1}{1-x}$ then find (CO2, K3) 10

i. fog
ii. gof
iii. gog
iv. fof

5-b. Let A={0,1,2,3,4}. Show that the relation R={(0,0),(0,4),(1,1),(1,3),(2,2),(3,1),(3,3)(4,0),(4,4)} is an equivalence relation. (CO2, K3) 10

6. Answer any one of the following:-

6-a. Find maximum and minimum value of the function $y = 2x^3 + 9x^2 + 12x$. (CO3, K3) 10

6-b. Find the value of a, if the function f(x) defined by (CO3, K3) 10

$$f(x) = \begin{cases} 2x - 1, & x < 2 \\ a, & x = 2 \\ x + 1, & x > 2 \end{cases}$$

is continuous at x = 2.

7. Answer any one of the following:-

7-a. Find $\int \frac{1}{(x-1)^2(x+2)}\,dx$. (CO4, K3) 10

7-b. Find $\int x^2 \sin x\, dx$. (CO4, K3) 10

8. Answer any one of the following:-

8-a. X and Y can do a piece of work in 20 days and 12 days respectively. X started the work alone and then after 4 days Y joined him till the completion of the work. Find the duration of the work. (CO5, K3) 10

8-b. A person sells a TV at a 30% loss for ₹1540. Find the price of TV, he sell it to gain 30%. (CO5, K3) 10